



IES

Newsletter

Volume 18, Number 1
January - February 2001

Notes from the Visitor Center ...

- **SAVE THE DATE:** March 31-April 1. See page 3 for a list of what's planned.

Bird-watching has always been a popular pastime for our visitors — their lists include spring warblers on the Wappinger Creek Trail, and eastern bluebirds, tree swallows, red-tailed hawks and ducks in the Lowlands. Now these visitors can enjoy their hobby all winter at the "Bird Viewing Station" in the Gifford House. Shortly before the holidays, Perennial Gardeners Diane Fagergren and Margaret Eyring 'planted' a large hawthorne branch in the annual bed and hung bird feeders, strings of cranberries and pine cones filled with peanut butter. Birds discovered the bounty some two weeks later and now come in flocks.

- We're trying out a new kind of paper in this issue of the *IES Newsletter*. "Domtar Weeds" is made of non-tree, renewable fibers: sugar cane and hemp. More about Forest-free Domtar Weeds in the next issue.

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Gypsy Moths, Adelgids and the Science of Soils

Gypsy moths were expected in 1998 but never showed up. Hemlock woolly adelgids, whose arrival in the Mary Flagler Cary Arboretum forests has been anticipated for some 10 years, were finally found here last summer. Hemlock bark beetles made their appearance last summer as well, with devastating consequences for the trees they infested. For forest ecologist Gary Lovett, these happenings — or non-happenings in the case of the gypsy moth — are the kinds of unexpected things that scientists expect in the course of their work.

Over the past 10 years, Dr. Lovett has monitored soil chemistry and nutrient cycling in Arboretum forests as part of a study called 'Forest Responses to Stress and Damage', or FORSTAD* for short. In the course of this research, he became particularly interested in two stresses, nitrogen deposition from the atmosphere (from acid precipitation), and gypsy moth attack. When gypsy moths chew up leaves the nitrogen in those leaves is digested and rains to the forest floor in the moths' frass (frass is insect excrement) — what would be the combined effect on the forest of acid deposition and gypsy moth defoliation?

Scientific literature reports that insect attack liberates nitrogen from the trees, and this nitrogen is then lost in runoff to stream water. In the course of his FORSTAD research, however, Lovett found that gypsy moth frass stimulated the growth of soil microbes, which retained a large proportion of the nitrogen. He also determined that any nitrogen the microbes missed the trees are capable of reabsorbing. To detail this observation more precisely, he designed an experiment to measure soil nitrogen during a gypsy moth outbreak.

Planning for the expected 1998 defoliation (see "A little entomology", page 2), he set up an experiment. Using paired forest plots, he and research assistant Julie Hart fertilized one set of plots with nitrogen to simulate nitrogen deposition from acid deposition; the other set, an experimental control, was left untreated. Fertilization began in 1996 to ensure substantial nitrogen levels in the trees and soils. The plan, explains Lovett, was that when the gypsy moths arrived he would eliminate all moths on a subset of each set of plots, using a virus that specifically targets gypsy moth caterpillars. The study would make it possible to measure the effects on nutrient cycling of nitrogen deposition alone,

* FORSTAD was funded by a grant to the Institute of Ecosystem Studies from the General Reinsurance Corporation. Among the studies by other members of the FORSTAD team are those that have led to the discovery of the complex interactions in oak forests that ultimately affect prevalence of Lyme disease.



Gary Lovett and Julie Hart look for signs of the woolly adelgid on Arboretum hemlock trees.

of gypsy moth frass alone, and of the two together, and to compare each to the other test plots and to the control. The scientists and the forest were ready, but the gypsy moths never came.

Meanwhile, in a second study, Lovett and his graduate student Lynn Christenson injected an oak tree in early spring with a non-radioactive isotope of nitrogen; the leaves that grew that year were therefore "tagged". Some of the leaves were harvested and fed to gypsy moth caterpillars housed in enclosures in the IES Rearing Facility. The scientists collected frass from the caterpillars, and, in autumn, litterfall from beneath the oak. Because the frass and the litterfall were tagged, after Christenson spread them on separate forest plots she could later follow the nitrogen as it made its way through the soil.

Oak leaves take a long time to decompose while frass dissolves when it's wet, Lovett explains. "Nitrogen from frass is transported rapidly down into the soil and is retained by the soil itself, in ways that we don't completely understand. Nitrogen from the leaf litter is released more slowly as the litter decomposes, and may be more available to plants."

Dr. Lovett also discovered that there was no loss of nitrogen from the soil, a direct contradiction of reports by scientists elsewhere. This is a good thing, he says. "Oak trees aren't fools. Nitrogen is scarce, so in fall they resorb it from the leaves, store it in twigs and use it again in spring." If gypsy *continued on page 2*

Gypsy Moths, Adelgids, Soils, from page 1

moths eat leaves early in the summer, which is when defoliation typically occurs, there is tremendous nitrogen loss from the trees, which must be able to recover a lot of this nutrient to make leaves the following year. "So," he concluded, "it's important for nitrogen to be retained in soil and not lost from the ecosystem."

Meanwhile, as the fertilized oak plots wait patiently for gypsy moths, the hemlock woolly adelgid has begun to creep into a different part of the Arboretum forest. Lovett and Hart set up another, similar set of plots in hemlock stands to monitor the effects of the adelgid. They are considering injecting selected trees with an insecticide to eliminate the adelgids. Then, over the short-term, as untreated trees die, changes in productivity, species composition, and nutrient cycling will be measured in the infested plots and compared to the treated plots. Over the long-term, Lovett will monitor the nature of soil and nutrient cycling processes as other species — probably oak, red maple and/or black birch — move in to replace the dead hemlocks.

A LITTLE ENTOMOLOGY ...

• **Gypsy moths** were brought from Europe to New England by Leopold Trouvelot in 1869. Trouvelot had hoped to start a silk industry in the U.S. but instead introduced an insect that rapidly became a major pest of forest and shade trees, especially oaks. Major episodes of defoliation by gypsy moth caterpillars typically occur every 9-10 years, most recently in 1980-81 and 1989-90, and so defoliation was predicted for 1998. This didn't happen, however, because a fungus killed the caterpillars. IES ecologists are monitoring this fungus as well as the gypsy moths.

• **Hemlock woolly adelgids** are tiny parasitic insects that suck sap from hemlock twigs. A clear indication that a tree is hosting these parasites is the appearance of tiny, fluffy white balls — adelgid egg sacs — on the twigs. Left untreated, the infected tree weakens and loses its needles; defoliation leads to death. Adelgids were introduced into the Pacific Northwest in the 1920s, probably from Japan. They turned up in Richmond, Virginia in the early 1950s and have been spreading into West Virginia and North Carolina and up into the Northeast at a rate of approximately 30 miles a year since then.

• **Hemlock bark beetles** were recorded here in summer 2000, when IES workers found dying hemlock trees and collected the insects that appeared to be responsible. Samples were sent to entomologists at the U.S. Department of Agriculture who identified the invader as a native pest that generally shows up in response to drought. Scientists assume, therefore, that the local infestation was due to the dry conditions of summer 1999, and because of ample rain during summer 2000 they don't expect to see the beetles this coming summer. (This is good news, because Hemlock bark beetles can kill a tree within several weeks!)

• **Hemlock leaf scale** — another sucking insect — has been around for some time but after IES scientists found adelgids on the Arboretum and started intensifying their surveys, they discovered that some hemlocks had serious scale infestations. It is unknown at this point if infection by hemlock leaf scale makes the trees more susceptible to adelgids.

And why do we care about nutrient cycling? This is the process whereby materials required for life enter and move through the ecosystem, like the input of nitrogen from the atmosphere and the weathering of rocks to liberate calcium. "Nutrient cycling in a forest is important," Dr. Lovett explains, "because it determines the system's produc-

tivity over time — how well the forest grows, and how quickly it recovers after disturbance." Dr. Lovett's long-term studies of Arboretum oak and hemlock stands, especially as affected by disturbances such as insect attack, are an evolving record of forest change.

Research Support Staff Supports More Than Research

The Institute's research support staff comprises the many individuals who collect, sample and measure at field sites and analyze, count and do data processing in laboratories. At any one time there are approximately 40 research assistants working with scientists at the Institute's labs in Millbrook as well as at IES sites at the Hubbard Brook Experimental Forest, in New Hampshire, and elsewhere across the U.S. and abroad. Many of the research assistants ("RAs") also contribute their free time and skills to their local communities, and frequently to the larger IES community as well. This column begins a series of profiles of research support staff.

Julie Hart, RA in the Lovett Laboratory

It's 4 a.m. Julie Hart's alarm clock won't go off for another three hours, but when the fire company pager sounds from her desk, she's up and into her blue jumpsuit almost before the 911 dispatcher has finished reporting the nature of the call. After meeting another EMT and an ambulance driver at the firehouse, she spends the hours until dawn assessing, caring for and transporting an ill or injured person to a local hospital. By the time she returns home, it's almost time to start her day.

Hart, a volunteer Emergency Medical Technician on the Town of Stanford's Rescue Squad, spends her workday as a research assistant in Dr. Gary Lovett's laboratory, assisting with his investigations into the

effects on nutrient cycling of insect damage to trees (see story beginning on page 1).

Eighty-eight lysimeters are collecting soil water at sites across Lovett's oak and hemlock forest research plots, to measure the quantity and the chemistry of water available to trees. Lysimeters work on the siphon principle, maintaining constant low-level tension to draw water up from the soil: a porous clay cup about the diameter of a tennis ball is buried 30-60 cm [12-24 inches] deep and connected to the above-ground containers by a tube. One of Hart's assignments is to visit each lysimeter several times a month to collect the water that has been extracted from the soil — often from 200 ml to 2 liters or more (7 ounces — 0.5 gallons) per lysimeter. At this time of year, when the Institute's roads are closed and the forest floor is snow-covered, she treks in on snowshoes carrying the plastic sampling bottles in her backpack.

Back in the IES laboratories, each soil water sample is analyzed by research assistant Denise Schmidt and her colleagues, and its chemistry compared with that of precipitation samples from the Institute's Environmental Monitoring Program and of through-fall (water dripping off leaves, branches and stems) collected on the Arboretum.

Hart's other laboratory work includes preparation of leaves and soil samples for



LONNA KELLY

nitrogen measurements, as well as data analysis. She currently is using a computer model and existing meteorological and forest canopy data to calculate the flow of water through soil.

Her workday has ended, but for eight evenings during January and February Hart is sharing her medical experience with IES colleagues. The Institute recently purchased an AED (automated external defibrillator), and Hart and several other EMTs are teaching CPR/AED classes at the Plant Science Building. At the end of the series, approximately 50 IES employees will be trained in these lifesaving techniques.

* * * *

Julie Hart has a bachelor's degree in biology from Bard College, in Annandale, New York. She has been a research assistant at the Institute since graduation in 1994, and her early experience here included sampling ticks and small mammals as part of the Lyme →

New Face in Continuing Education

Jamey Thompson, instructor of biology and environmental science at Maysville Community College in Kentucky, was planning a move to New York State. Checking out the job situation on the Internet, he found a posting for "Program Leader, Continuing Education Program" at the Institute of Ecosystem Studies. He looked up Continuing Education on the IES Web site, was impressed by what the program offers and mailed off his resume. Two months later, he was comfortably installed in the Continuing Education Office, planning the winter semester and developing new directions for the program.



Jamey Thompson, new IES Program Leader for Continuing Education.

The IES Continuing Education Program has a strong ecological focus, and it was this that especially impressed Thompson. "The Institute's work deals with how we, as a global community, have an impact on our own landscapes," he says. "Our classes help to reinforce in our students' minds how we should treat the landscape on a local scale, especially around our homes, in an environmentally sustainable way."

The Institute has three certificate programs: landscape design, gardening and natural science illustration. Landscape design and gardening programs have a solid ecological focus and he plans to build on that foundation. New courses will increase the emphasis on organic options, including low- or no-spray pest control, and the use of native plants (or, at least, not planting invasive

species). And the benefits of these lessons will extend beyond those to the students themselves, Thompson explains. "We'll also be educating the marketplace, because when our students shop, they'll be requesting native plants as well as services and products that are environmentally sound."

Mr. Thompson speaks enthusiastically about new courses he is adding to the program. "We have some land near the Gifford Tenant House [next to the Gifford House Visitor and Education Center], and our new Perennial Gardener, Diana Fagergren, is going to use it as a classroom to teach Landscape Design students how to prepare a garden plot." Tentatively scheduled for early June, this one-day course will begin with a discussion of soil nutrient and texture amendments and will end with actual soil preparation by the students. "Some of our students have strong design skills but little practical experience in preparing an area for a new landscape. This hands-on class will be of tremendous benefit to these students," Thompson predicts, adding that it also sets the stage for a new venture for the Continuing Education Program: a gardening class for children. The prepared garden will be used for a multi-session program beginning in June, he explains, in which children and their parents will learn how to plant and raise flowers and vegetables. Details of both classes are in the spring catalogue, available in late February. ●

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You say you don't have the need or the time to pursue a certificate? Many Continuing Education Program students take courses individually, for personal interest and enrichment. Prospective and returning students may call 845-677-9643 or visit Continuing Education on the IES Website at www.ecostudies.org/cep, for course and registration information.

The Continuing Education Program office, which Jamey Thompson shares with Program Assistants Luanne Panarotti and Edith Keck, is at the Gifford House Visitor and Education Center, 181 Sharon Turnpike, Millbrook, N.Y. Office hours are Monday and Wednesday, 8:30 a.m.-1 p.m., and Tuesday, Thursday and Friday, 10:30 a.m.-3 p.m.

Programs offered during March and April 2001 are listed in the calendar on page 4.

Hart, from previous page

disease ecology work; seed collection and seed predation at Great Mountain Forest in Connecticut; studies of the forest edge; and even work in the Greenhouse when Becky Curtis was on maternity leave. (Those of you who attended the 25th Anniversary Celebra-

tion in the Greenhouse in 1998 may remember the gingerbread model of the facility, done to scale and complete with tiny candy plants. Hart, with an equally creative colleague from the IES Education Program, was the creator of that masterpiece.) ●

Public Weekend at IES

March 31 and April 1

• Regional Artisan's Market:

Locally made products for sale at the Gifford House

• Raffle

• Continuing Education Program information booth

• Volunteer Program information booth

• Light Refreshments

Free programs for all ages will include:

SATURDAY, MARCH 31

- Raptor Ecology and Demonstration by Jim Eyring
- At the Greenhouse ...
 - ... Origami Class
 - ... "Plant Power"
 - ... Planting for Kids
 - ... Economic Botany Trail

SUNDAY, APRIL 1

- Guided walk for families
- "Ask the Gardener": Q & A with Brad Roeller, Manager of the IES Display Gardens
- Meet-the-author and book signing: Mike Ruggiero, author of *Annuals with Style* and IES Continuing Education Program instructor
- Pruning Demonstration and Practice
- Art Exhibit Opening: "Remnants: Ancient Forests and City Trees" by Prilla Smith Brackett
- Guided tour: Likens Laboratory and the Plant Science Building laboratories
- Raffle Drawing at 3:45 p.m.

When the program is finalized, a complete schedule of activities will be published online at www.ecostudies.org/welcome/new.html

Students in Grades 1-6...

Sign up now for Summer Ecology Day Camp

One-week sessions begin June 25. There are two groups of campers, those entering grades 2-4 and those entering grades 5-7, in fall 2001.

- do ecology investigations
- hike
- sharpen your powers of observation
- do nature art projects ... and much more

For registration information, call the IES Education Office at 845-677-7600 ext. 316

Registration deadline: June 1

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CONTINUING EDUCATION
For winter and spring semester program information, or to request a catalogue, call the Continuing Education office at 845-677-9643. Programs during March and April are:

Gardening

Mar. 3: **Spring Plant Propagation**

Mar. 5 (4 sessions): **Fundamentals of Gardening**

Mar. 17 (6): **Soil Science**

Mar. 24: **Basic Cultural Techniques for Perennials**

Apr. 5 (6): **Insect Pests and Diseases of Plants**

Apr. 21 (4): **Plants for the Landscape: Woody Plants**

Apr. 21: **Spring Gardening Q and A**

Apr. 28 (2): **A New Landscape for Your Home!**

Landscape Design

Mar. 10: **History of Landscape Design**

Mar. 28 (8): **Landscape Design III: Planting Design Biology**

Apr. 22 (2): **Wild Plant Identification: Spring**

Apr. 23 (4): **Herbs: Garden to Kitchen**

Apr. 26 (6): **Nature's Pharmacy: Herbal Remedies Natural Science Illustration**

Mar. 10 & 11: **Drawing in the Greenhouse**

Mar. 13: **How to Mat Your Masterpiece**

Mar. 15-18: **Pen and Ink II: Illustration Workshop**

Apr. 6: **Growing Your Small Business Excursion**

Mar. 5: **Philadelphia Flower Show**

* Visit *Continuing Education on the IES Website, at www.ecostudies.org/cep*

VOLUNTEER OPPORTUNITIES

Perennial Garden Docents Program begins soon! For information on this and other volunteer positions, call Su Marcy at 845-677-7600 ext. 317.

THE ECOLOGY SHOP

New in the Shop ... jewelry made of sustainably harvested materials from the Amazon rainforest ... Burt's Bees ® gardener's soap and hand salve ... for children ... 52-things-to-do cards (rainy day, in-the-car, nature) ... make-your-own kaleidoscope kits ... in the Plant Room ... mud gloves in assorted colors

Regional Artisan's Market: 10-4 on Saturday, March 31, and 11-4 on Sunday, April 1

Senior Citizens Days: 10% off on Wednesdays

For information on current IES public events and attractions, visit: www.ecostudies.org/welcome/ThisWeek.html.

For garden tips, follow the link to the Perennial Garden Archives.

Calendar

IES SEMINARS

Free scientific seminars are held each Friday from September until May, at 11 a.m. in the Auditorium.

Mar. 2: **Working with Nature: the Use of Natural Disturbance Patterns to Guide Management of Southern Pine Woodlands**. Dr. Robert Mitchell, Jones Ecological Research Center, Georgia

Mar. 9: **The Role of Positive Interactions in Shoreline Communities**. Dr. Mark Bertness, Brown Univ.

Mar. 16: **Jumping on the 'Science as Inquiry'**

Education Bandwagon: Bumps, Bruises and Smooth Rides. Dr. Marianne Krasny, Cornell Univ.

Mar. 23: **Linking Ecosystem Science and Restoration Ecology: Making the Whole Greater Than the Sum of the Parts**. Dr. Christopher Craft, Indiana Univ.

Mar. 30: **Tree Seed Production, Small Mammals, and the Dynamics of Northeastern Forests**. Dr. Jaclyn Schnurr, Idaho State Univ.

Apr. 6: **Whole Effluent Toxicity Testing and the National Pollutant Discharge Elimination System: Examining the Assumption of Adequate Protection**. Dr. Paul White, Health Canada

Apr. 13: Title to be announced. Speaker: Dr. Hank Loescher, Univ. of Florida

Apr. 20: **Effects of Landscape Position on the Biogeochemistry of Lakes in River Floodplains and Deltas**. Dr. Lance Lesack, Simon Fraser Univ., Canada

Apr. 27: **Superorganism or a Big Pile of Bugs: Colonial Physiology of the Fungus-Cultivating Termite *Macrotermes michaelisent***. Dr. Scott Turner, Environmental Science and Forestry, SUNY May 4: Cary Conference IX Speaker, TBA

HOURS

Winter Hours: October 1 - March 31

Public attractions are open Mon. - Sat., 9 a.m.-4 p.m. & Sun. 1-4 p.m., with a free permit. (Note: The Greenhouse closes at 3:30 p.m. daily.)

• Free permits are required for visitors and are available at The Ecology Shop or the Education Office until one hour before closing time.

The Ecology Shop is open Mon.- Fri., 11 a.m.-4 p.m., Sat. 9 a.m.-4 p.m. & Sun. 1-4 p.m. (The shop is closed weekdays from 1-1:30 p.m.)

Hours, continued:

Summer hours begin April 1.

From April 1 through the end September the display gardens, trails and roadways are open until 6 p.m., and The Ecology Shop until 5 p.m.

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$40; family membership: \$50. Call the IES Development Office at 845-677-5343.

The Institute's Aldo Leopold Society

In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call the IES Development Office at 845-677-5343.

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... for education, general information and The Ecology Shop:

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